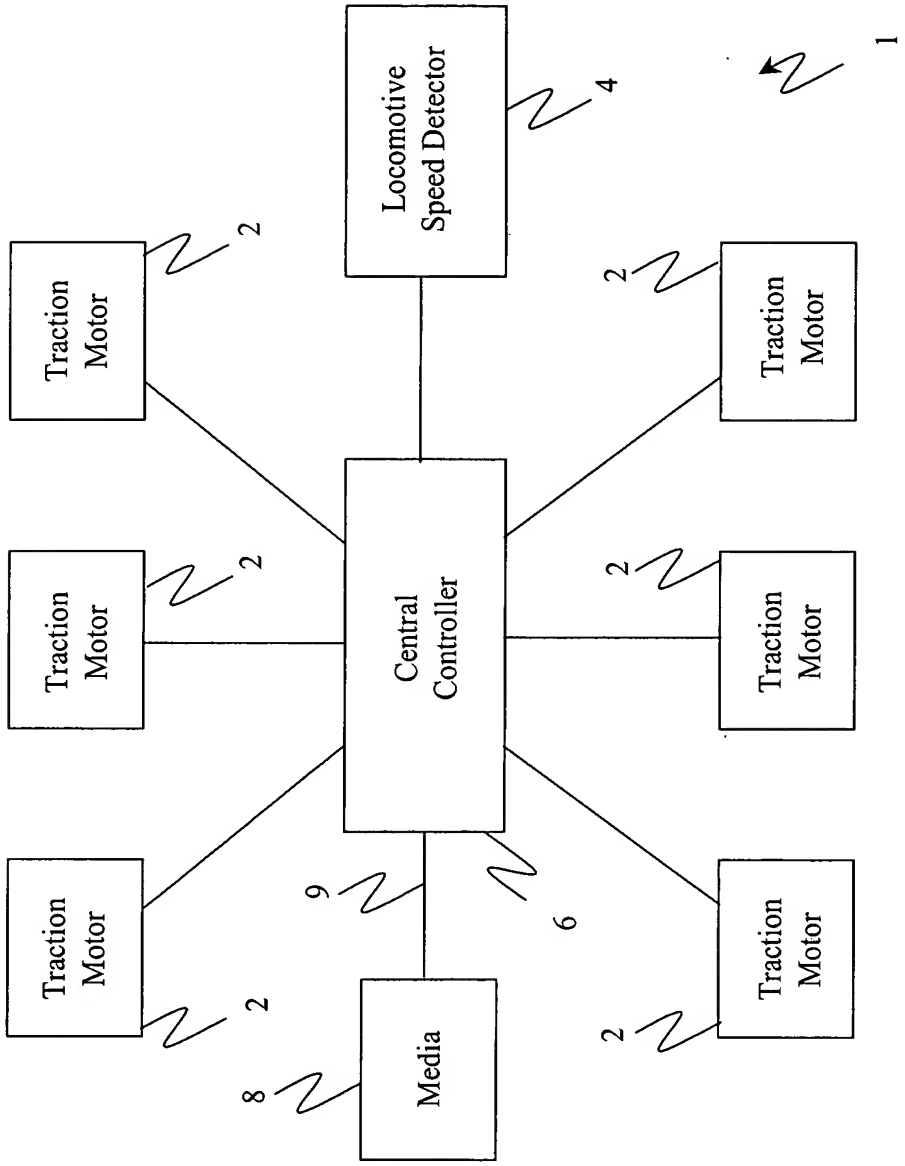
Locomotive Speed Detector
4
1
Traction Motor
2
Traction Motor
2
Traction Motor
2
Central Controller
Traction Motor
2
Traction Motor
2
Traction Motor
2
Traction Motor
2
9
6
Media
8

FIGURE 1

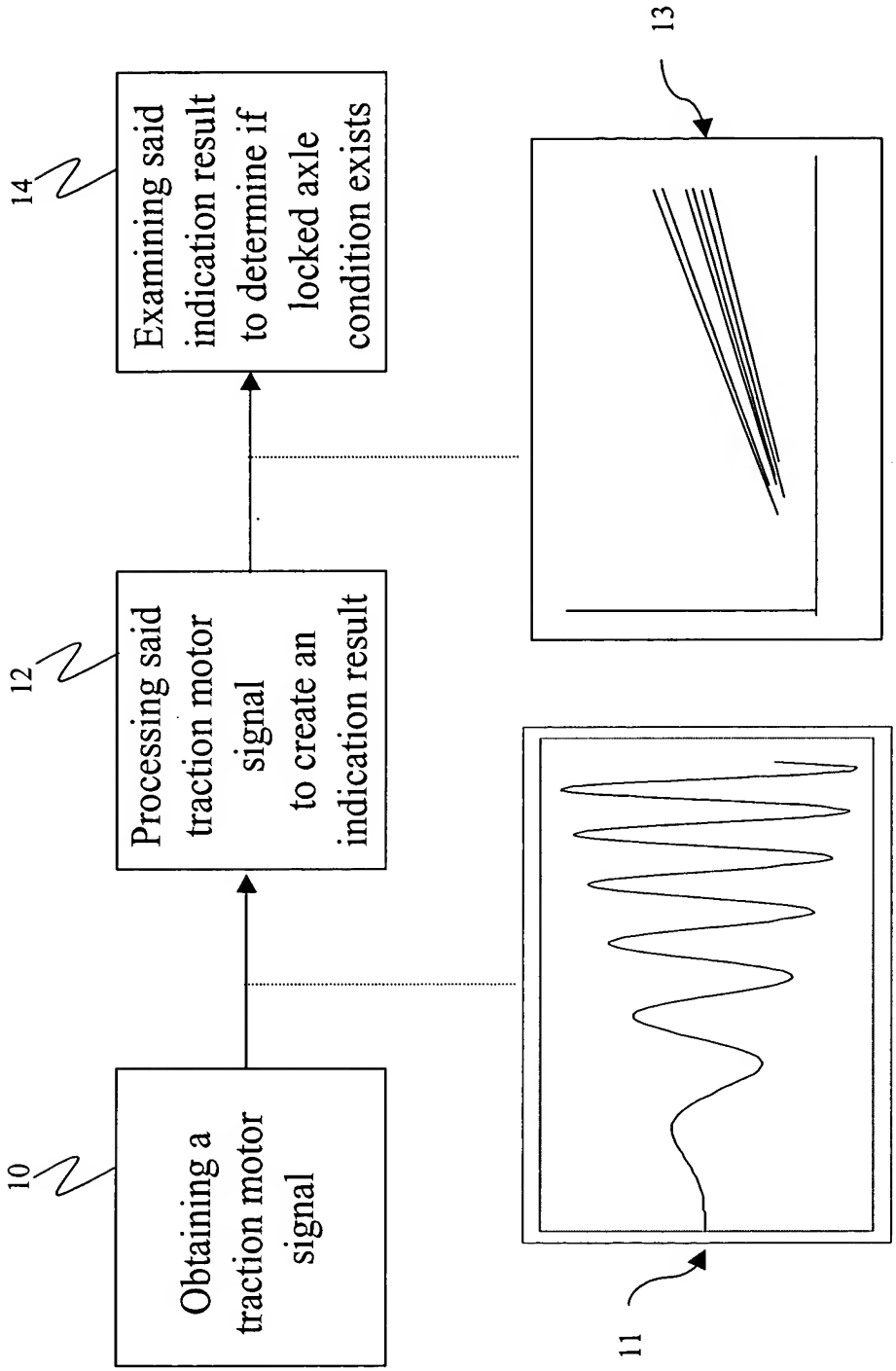
10
Obtaining a traction motor signal
12
Processing said traction motor signal to create an indication result
14
Examining said indication result to determine if locked axle condition exists
11
13

FIGURE 2

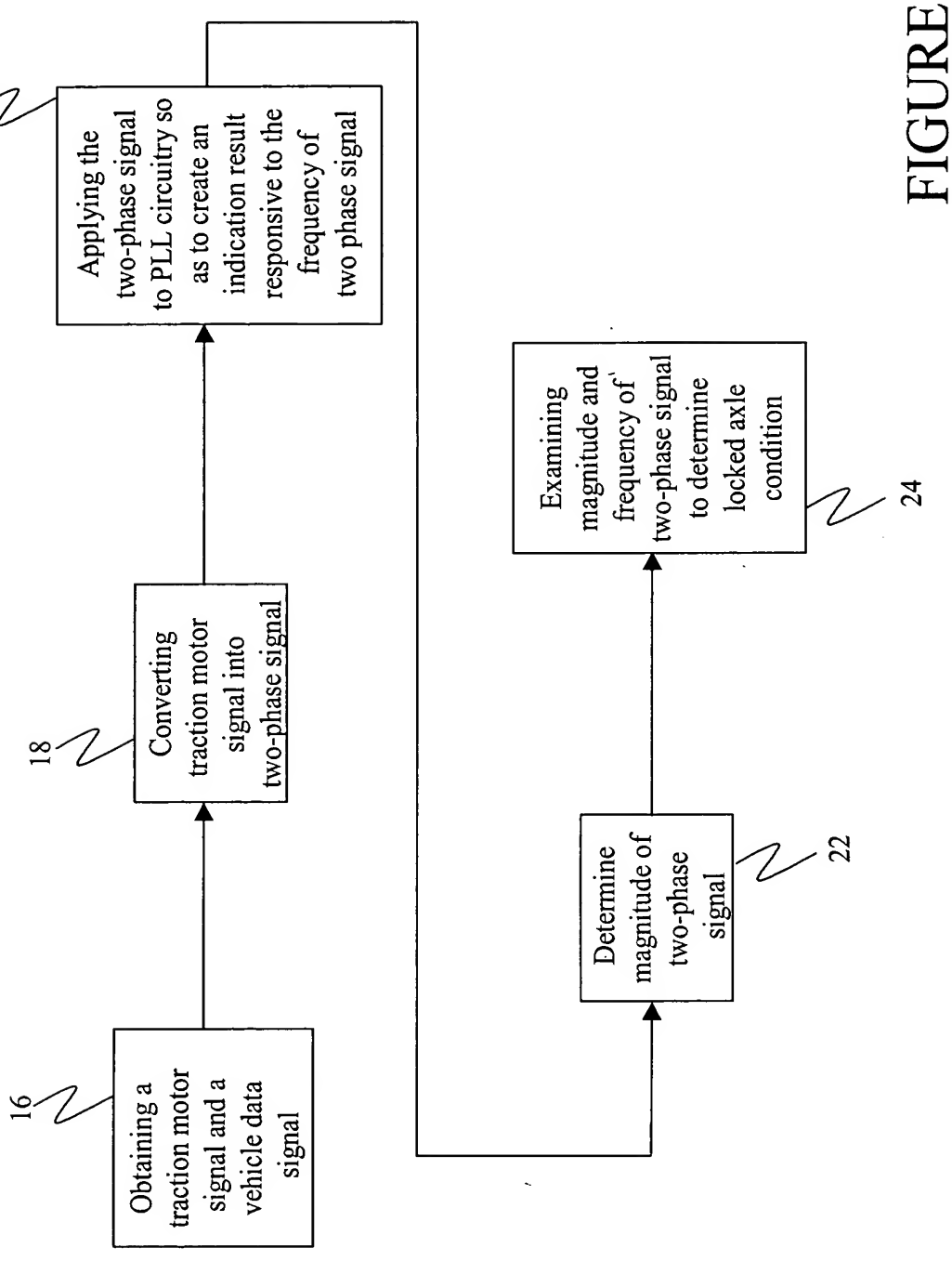
Obtaining a traction motor signal and a vehicle data signal
16
Converting traction motor signal into two-phase signal
18
Applying the two-phase signal to PLL circuitry so as to create an indication result responsive to the frequency of two phase signal
20
Determine magnitude of two-phase signal
22
Examining magnitude and frequency of two-phase signal to determine locked axle condition
24

FIGURE 3

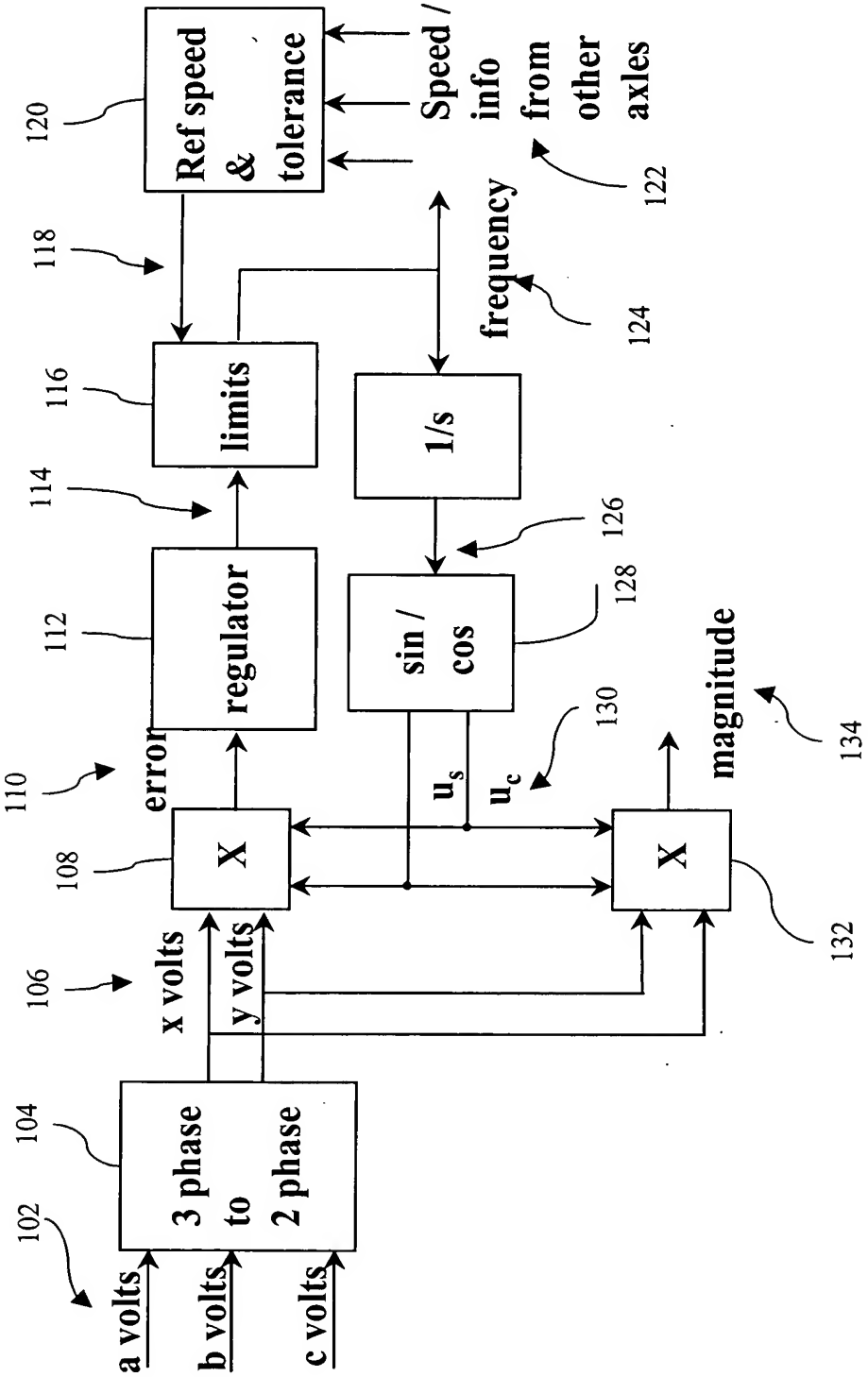

Figure 3a. Phase Locked Loop Frequency and Magnitude Determination

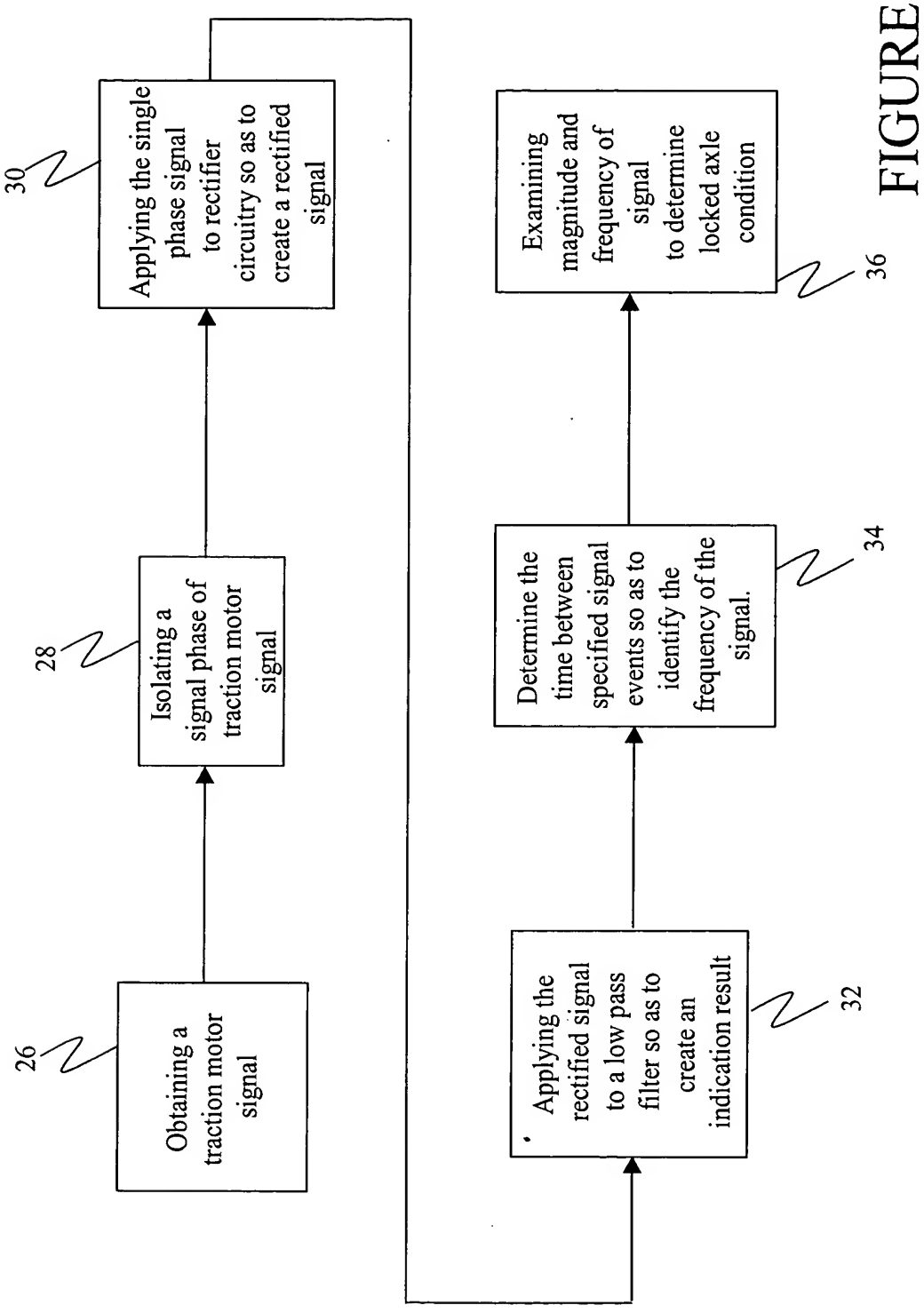
Obtaining a traction motor signal
26
Isolating a signal phase of traction motor signal
28
Applying the single phase signal to rectifier circuitry so as to create a rectified signal
30
Applying the rectified signal to a low pass filter so as to create an indication result
32
Determine the time between specified signal events so as to identify the frequency of the signal.
34
Examining magnitude and frequency of signal to determine locked axle condition
36

FIGURE 4

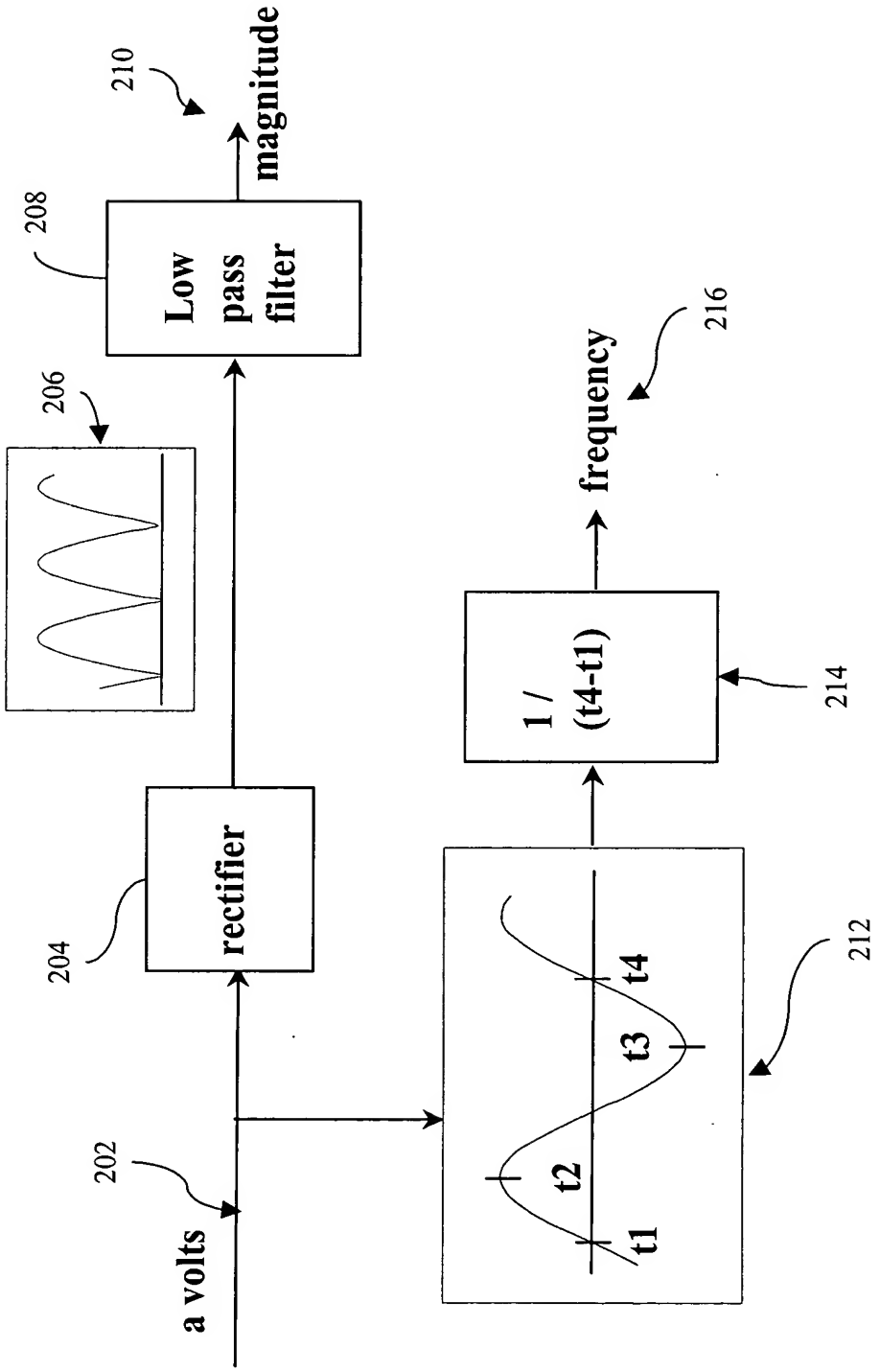

Figure 4a. Time between specified values for frequency determination

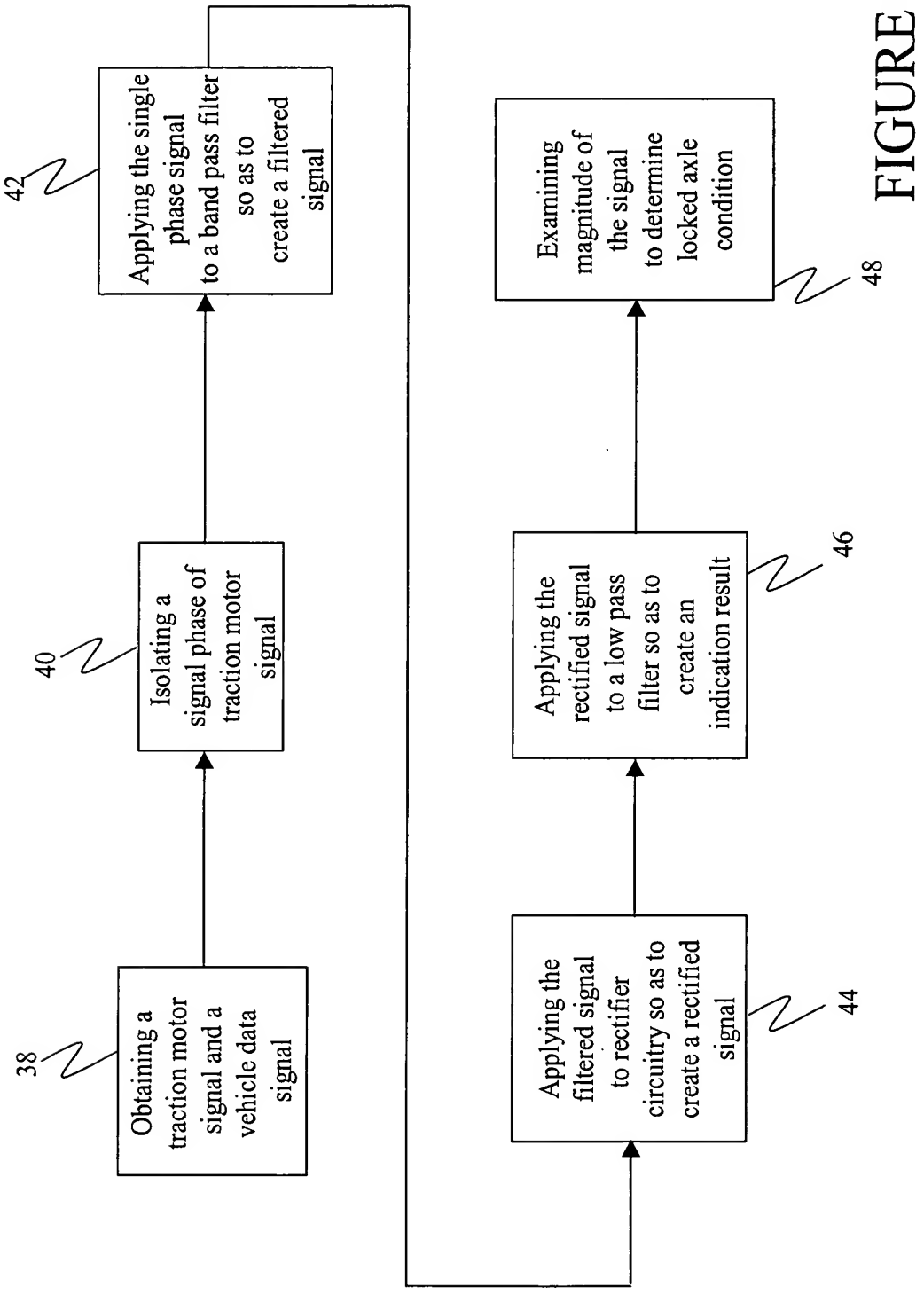
Obtaining a traction motor signal and a vehicle data signal
38
Isolating a signal phase of traction motor signal
40
Applying the single phase signal to a band pass filter so as to create a filtered signal
42
Applying the filtered signal to rectifier circuitry so as to create a rectified signal
44
Applying the rectified signal to a low pass filter so as to create an indication result
46
Examining magnitude of the signal to determine locked axle condition
48

FIGURE 5

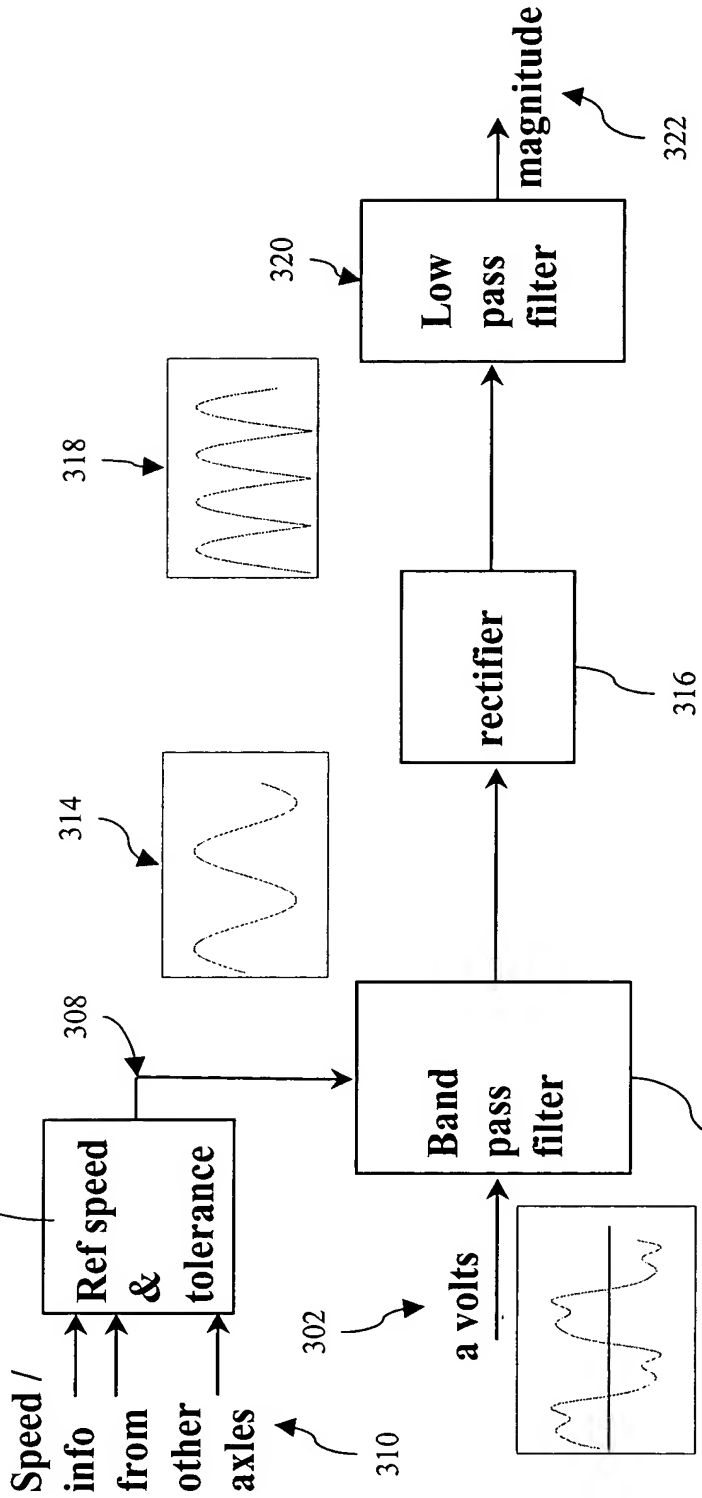

Figure 5a. Band pass filter for magnitude determination

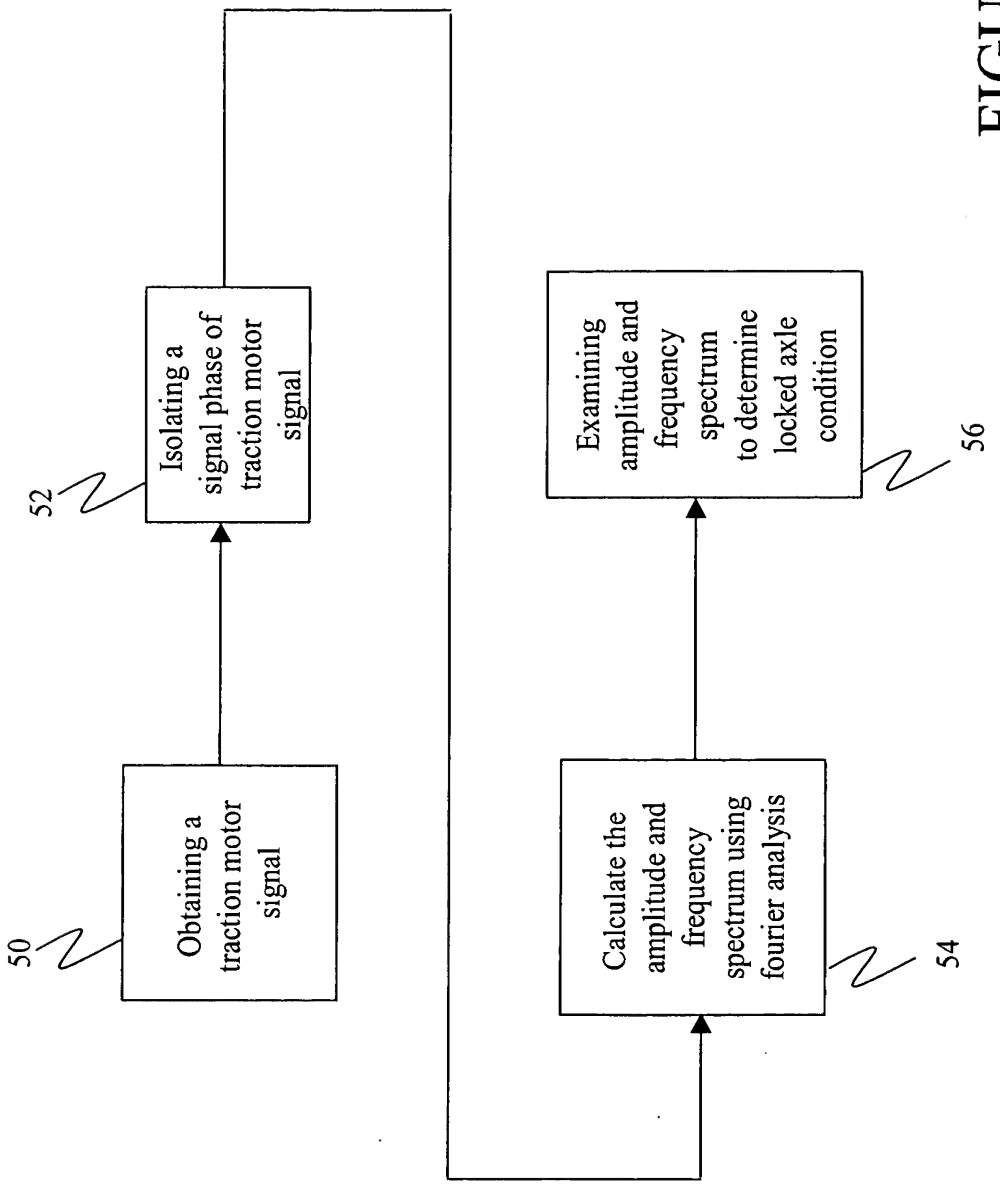
Obtaining a traction motor signal
50
Isolating a signal phase of traction motor signal
52
Calculate the amplitude and frequency spectrum using fourier analysis
54
Examining amplitude and frequency spectrum to determine locked axle condition
56

FIGURE 6

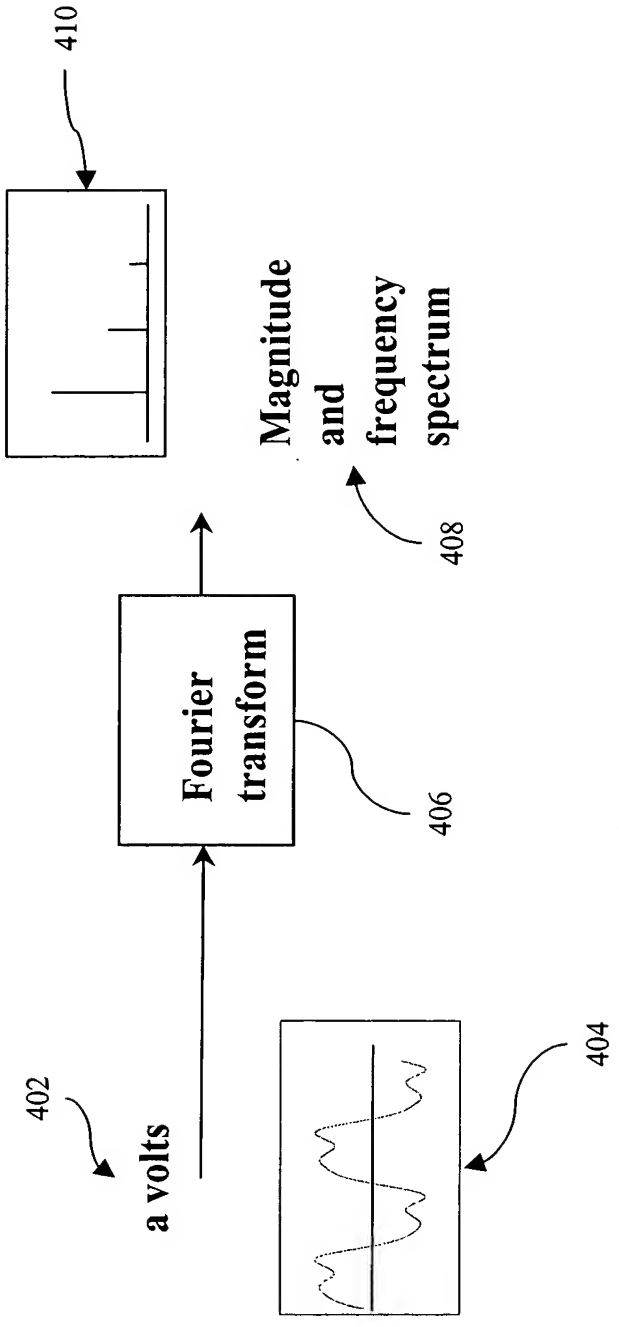

Figure 6a. Fourier Transform for frequency determination